PROCESS OF DETACHING AND/OR ATTACHING AN AUTOMOTIVE CONTROL ARM

RELATED APPLICATION

This is a continuation-in-part of U.S. Patent Application 10/464,407, filed 18 June 2003, which is a Continuation of U.S. Patent Application 09/850,312, filed 7 May 2001, now issued as U.S. Patent 6,606,775, which is a Divisional application of U.S. Patent Application 09/568,191, filed 9 May 2000, each of the foregoing hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to automotive repair tools and, in particular, this invention relates to a tool separating components of automotive suspension systems.

2. Background of the Invention

When technicians are repairing automobiles, they frequently encounter difficulty when disconnecting suspension parts. While many of these suspension parts are connected using nuts, bolts, bearings and the like, they are exposed to dust, moisture, and other corrosive compounds during use. Consequently, disconnecting these suspension components can be difficult, hazardous, and often causes collateral damage to other automotive components as well. For example, when the lower control arm is being detached from a steering knuckle, a pry bar is frequently inserted between the control arm and the frame or transaxle floor pan. When force is then exerted on the pry bar, the transaxle floor pan may be dented or otherwise damaged. Moreover, other components may be similarly damaged if used as fulcrum points as well. Furthermore, the technicians frequently must apply the pry bar at mechanically disadvantageous angles and lengths due to the outlay of the suspension and surrounding components.

There is then a need for an implement to enable a technician to safely and efficiently detach automotive lower control arms.

SUMMARY OF THE INVENTION

This invention substantially meets the aforementioned need by providing a leveraging tool, the leveraging tool including a leveraging member, a fulcrum point, and a securing element. The leveraging member may be configured to be grasped by a user. The fulcrum point is disposed on or proximate the leveraging member. The securing element is attachable to the leveraging member and is configured to apply an output force to an automotive part such as a lower control arm. The output force is applied in response to an input force exerted on the leveraging member when the fulcrum is positioned against a pivoting structure on the automobile. In one embodiment the output force is maintained by an anchoring member, the anchoring member reversibly attached to a portion of the automobile frame.

One feature of the present leveraging tool is that automotive suspension parts can be detached more easily and with greater relative safety.

Another feature of the present leveraging tool is that automotive suspension parts can be detached without damaging other adjacent structures.

Yet another feature of the present leveraging tool is that an automotive part can be safely maintained in a biased position by reversibly attaching an anchoring member to a portion of the automobile.

These and other objects, features, and advantages of this invention will become apparent from the description which follows, when considered in view of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary front view of a typical front wheel drive automobile suspension;

FIG. 2 is a fragmentary bottom view of the front wheel drive automotive suspension of FIG. 1;

FIG. 3 is a perspective view of a first embodiment of the present leveraging tool;

FIG. 4 is a perspective view of a second embodiment of the present leveraging tool;

FIG. 5 is an end view of the leveraging tool of FIG. 4;

FIG. 6 is another perspective view of the leveraging tool of FIG. 4;

FIG. 7 is a front view of a third embodiment of the present leveraging tool;

FIG. 8 is a front view of the leveraging tool of FIG. 3 being used to detach the lower control arm depicted in FIGS. 1 and 2;

FIG. 9 is a perspective view of a fourth embodiment of the present leveraging tool; and

FIG. 10 is a perspective view of the embodiment of FIG. 9 being used to install an automotive lower control arm.

DETAILED DESCRIPTION

Referring FIGS. 1 and 2, a typical front suspension and drive train is depicted for a front wheel drive vehicle generally at 50. Rotary power is transmitted from a transaxle 52 to a wheel bearing and hub assembly 54 via a CV-axle 56. The wheel bearing and hub assembly 54 is rotatably mounted in a steering knuckle 58. A strut 60 is attached to the steering knuckle 58. A coil spring 62 is disposed about a portion of the strut 60 to support and stabilize a portion of the vehicle. A lower control arm 64 is pivotally attached to a frame member 66 at a pair of control arm first ends 68. A control arm second end 70 is attached to the steering knuckle 58 by ball joint 72 and held in place with a fastener 74. A sway bar 76 is attached to the lower control arm 64 proximate its second end 70 by a bushing 78.

Referring to FIG. 3, a first embodiment of the present detaching/leveraging tool is depicted generally at 100. This embodiment of the present invention is formed from steel tubing and includes respective first and second portions 102 and 104, which are generally separated by a bend 106. A brace 108 may extend between the first and second portions 102 and 104 to provide rigidity. A pivot pad 110 may be present on an upper side of the second portion 104 proximate the bend 106. Another bend is formed in a member 112. One end of the member 112 is welded to the leveraging tool proximate a first end 114. A second end of the member 112 is welded to the brace 108. A recurring element, such as chain (or cable) 116, is disposed between the member 112 and the underside of the leveraging tool 100. The chain 116 may include a hook or another device or combination (e.g., nut and bolt) to fasten the chain around both the leveraging tool second portion 104 and an automotive component such as a control arm. In this embodiment, the leveraging tool 100 is made from 1.25" diameter steel tubing with a thickness of 0.125". The pivot pad 110 is made from 0.125" thick steel plate and is about 4"x 4" in dimension. In some embodiments, a high tack or rubberized

substance may overlay the pivot pad 110 to reduce slippage during use. The pivot pad 110 is disposed over a position on the leveraging tool 100 which is a pivot or fulcrum point during use. In this embodiment of the present leveraging tool, the first portion 102 is about 4' in length and the second portion 104 is about 2' in length. Also in this embodiment of the present leveraging tool, the second portion 104 is angled about 80 degrees from the first portion 102. However, the second portion 104 may be angled about 68 degrees, between about 75 degrees and 85 degrees, between about 70 degrees and 90 degrees, between about 90 degrees and 95 degrees, or between about 85 degrees and 100 degrees from the first portion 102 in other embodiments. In some embodiments, the first portion 102 may include telescoping sections 118 and 120 and tightener coupling 122. Telescoping section 118 telescopes inside section 120 in this example, although obviously section 120 could telescope inside section 118 as well. The coupling 122 threads onto section 120, fixes the sections at a desired length when tightened, and allows the sections to be adjusted to a desired length when loosened. Rather than coupling 120, other length adjusting mechanisms known to the art may be used, e.g., a pin or bolt fitting into a series of aligned holes in the sections 118 and 120. One of the sections 118 and 120 may be solid if a strengthened embodiment is desired.

This and other embodiments of this invention may be made from solid or hollow (e.g., tubular) metal alloys known to the art such as steel, cast iron, and aluminum.

FIGS. 4-6 depict a second embodiment of the present leveraging tool generally at 130. The leveraging tool 130 includes a first portion 132 and a second portion 134 defined by a bend 136. The second portion 134 may angle from the first portion 132 as explained above with respect to leveraging tool 100. The first and second portions 132 and 134 may be formed from solid steel in this embodiment. The solid steel from which the leveraging tool 130 is formed may be 1" or 11/4" in diameter. Also in this embodiment, a securing element, such as square cornered C-hook 138 member, is attached to the second portion 104 proximate the second portion end 139. The C-hook 138 includes arms 140 and 142. The arm 142 extends generally diametrically through holes formed in the second portion 134. A plate 144, with holes 146 and 148, may be provided to provide rigidity to the C-hook 138. In this embodiment, the arm 140 may be disposed in the hole 146 and the arm 142 may be disposed in the hole 148 during use. The C-hook may be made from 1/2" diameter steel. The arms 140 and 142 may be about 6" in length and may be spaced apart by about 6". The first and second

portions 132 and 134 may generally be about the same lengths as the first and second portions 102 and 104 of the leveraging tool 100. A pad 150 is welded, or otherwise fixed, to an upper surface of the second portion 134 at a pivot or fulcrum point thereof.

FIG. 7 shows a third embodiment of the present leveraging tool 160. The leveraging tool 160 includes respective first and second ends 162 and 164. A pad 166 is fixed proximate the first end. A hook 168 extends from the leveraging tool 160 at a distance of between about 2' and 3' from the second end 164 in one embodiment. The hook 168 may be fixed or may be configured to slid along the leveraging tool to a desired position. Of course, a chain or cable, as described above, may be used in place of the hook 168.

FIG. 8 depicts how the embodiments described in FIGS. 3-6 may be used in automotive repair, e.g., separating the control arm 64 and ball joint 72 from the steering knuckle 58. The chain 116 is fastened about a desired place on the control arm and positioned such that the pivot pad 110 can contact the frame member 66, or another suitable pivot site such as a portion of the control arm itself. The first portion 102 is grasped by the user, the pivot pad 110 (or fulcrum point) is positioned against the frame member 66. The user then grasps the first portion 102 and exerts an input force generally in the direction of arrow 190. The input force is leveraged by the present tool to produce an output force generally in the direction of arrow 192. The sway bar 76 is still attached to the control arm 64 in this example. Therefore, the control arm must be biased away from the steering knuckle by the sway bar as depicted. Obviously, differing amounts of input force must be exerted depending upon the particular model of control bar, as well as other factors such as the extent of corrosion and rust present proximate the ball joint. Nonetheless, the control arm and ball joint are separated from the steering knuckle to enable subsequent repairs.

FIG. 7 depicts the embodiment shown therein detaching the control arm and ball joint from the knuckle. When using this embodiment, the pad 166 is positioned against the frame member 66 or other desired structure and the hook 168 is hooked around a desired position on the control bar. In some embodiments, the distance between the hook and second end 164 may be adjusted. The input force is exerted generally in the direction of arrow 190 to result in an output force generally in the direction of arrow 192. The input force is exerted until the control arm and ball joint are freed from the steering knuckle. The embodiment depicted in

FIG. 7 may be especially useful when the automobile being repaired is not be positioned on a hoist.

Referring generally to Figures 9 and 10, yet another embodiment of the present invention is indicated at 200. In addition to features described above, the leveraging tool includes an anchoring member 204 attached in opposition to the direction of the second portion 134. Attachment may be so as to enable a pivot 205 at the point of attachment to the first portion 132. The anchoring member may include respective first and second members 208 and 210, an adjustment member 212, and an anchoring element 214. In the embodiment depicted, the first and second members 208 and 210 thread oppositely into the adjustment member 212, so as to increase or decrease the length of the anchoring member 204. The anchoring element 214 is an end of the first member 208 configured as a hook in the embodiment depicted. However, the instant invention contemplates other structures, e.g., straps, nut-bolt combinations, and the like, as being present in other embodiments. In use, the leveraging tool is used for repair activities, such as separating the steering knuckle from the control arm as explained and depicted above. Once the control arm is biased away from the steering knuckle and in a desired position, the position of the control arm is maintained by hooking a portion of the auto frame with the anchoring element 214, then increasing or decreasing the length of the anchoring member 204. The anchoring element 204 is increased or decreased by rotating the adjustment member 212 clockwise or counterclockwise. The desired repairs and replacements can then be effected and the control arm can be returned to an unbiased position. This is accomplished by a exerting a force on the first portion 132 so as to unhook the anchoring element 214 from the automotive frame, then allowing the control arm to return to the unbiased position. The leveraging tool 200 allows a single person to effect repairs by maintaining the control arm in a biased position without the requirement of continuously exerting the necessary force.

Because numerous modifications of this invention may be made without departing from the spirit thereof, the scope of the invention is not to be limited to the embodiments illustrated and described. Rather the scope of the invention is to be determined by the appended claims and their equivalents.